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(54) **METHOD AND DEVICE FOR THE PRODUCTION OF A COVERED ELASTIC YARN AND FOR AUTOMATIC REPLACEMENT OF FEEDS SPOOLS**

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D02G 3/36 (2006.01)

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(58) **Field of Classification Search** 57/3, 57/6, 19, 266, 276, 280
See application file for complete search history.

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Primary Examiner—Shaun R Hurley
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(57) **ABSTRACT**

The device has: a first interlacing jet (**19**); a feed path of the covering yarn (FT) and a feed path of the elastic yarn (F**1**; F**2**) towards the first interlacing jet; supporting elements (**37**A, **37**B) for spools of elastic yarn (R**1**, R**2**); winding members (**54**) to wind the composite yarn (FC) on the cop being formed (BC); an interruption device to interrupt feed of composite yarn to the cop being formed and start winding the composite yarn on a new winding tube. The supporting elements for the spools of elastic yarn are suitable to support at least a first spool of elastic yarn and at least a second spool of elastic yarn; associated with the first interlacing jet are a retaining member (**20**) to withhold an initial free end of the elastic yarn of the second spool and a deflecting element to withhold an initial portion of the second elastic yarn during delivery of the first elastic yarn to the interlacing jet; a sensor to detect interruption of feed of the first elastic yarn to the first interlacing jet; a control to control release of the initial portion after interruption of feed of the first elastic yarn has been detected.

46 Claims, 8 Drawing Sheets

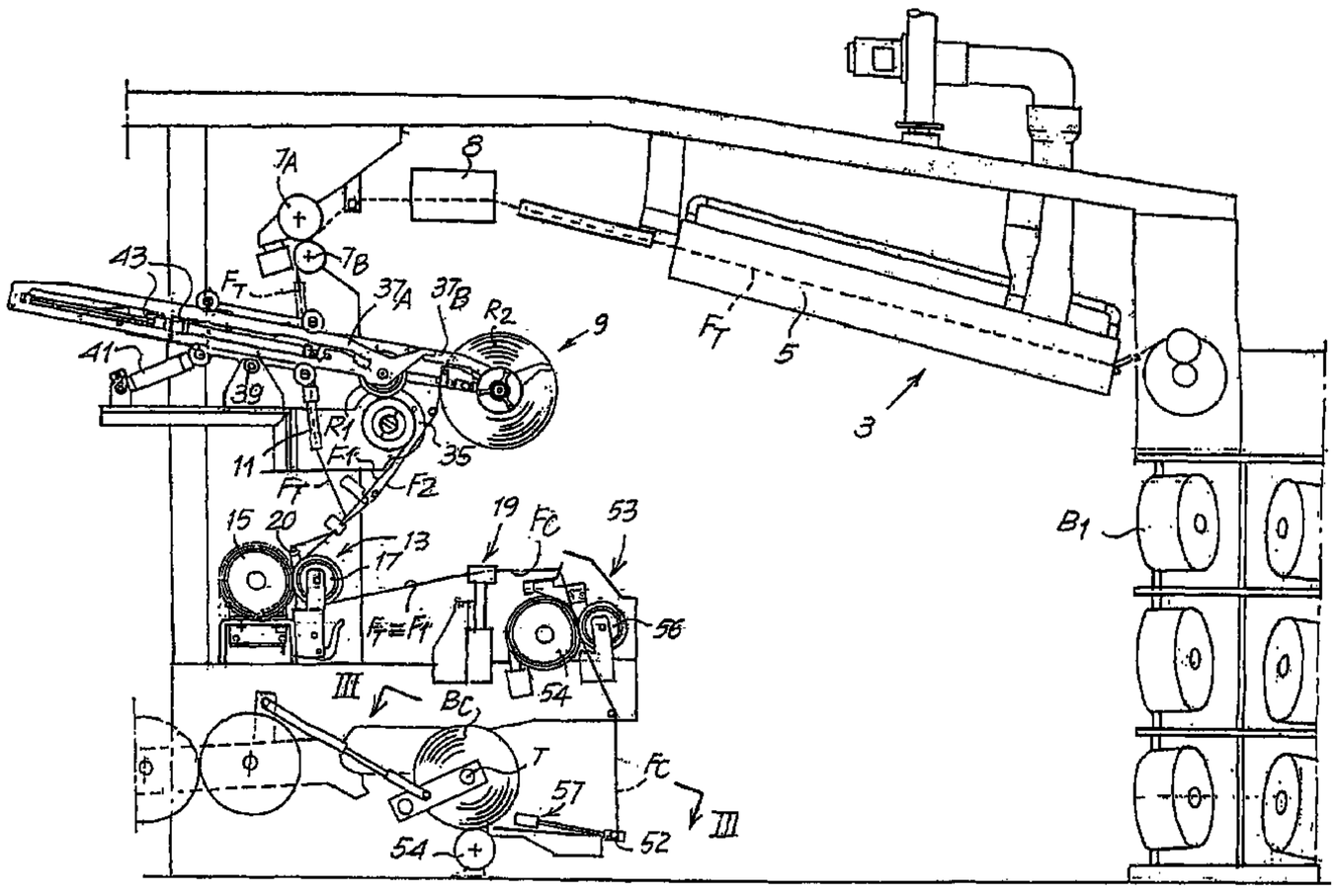

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Fig.1

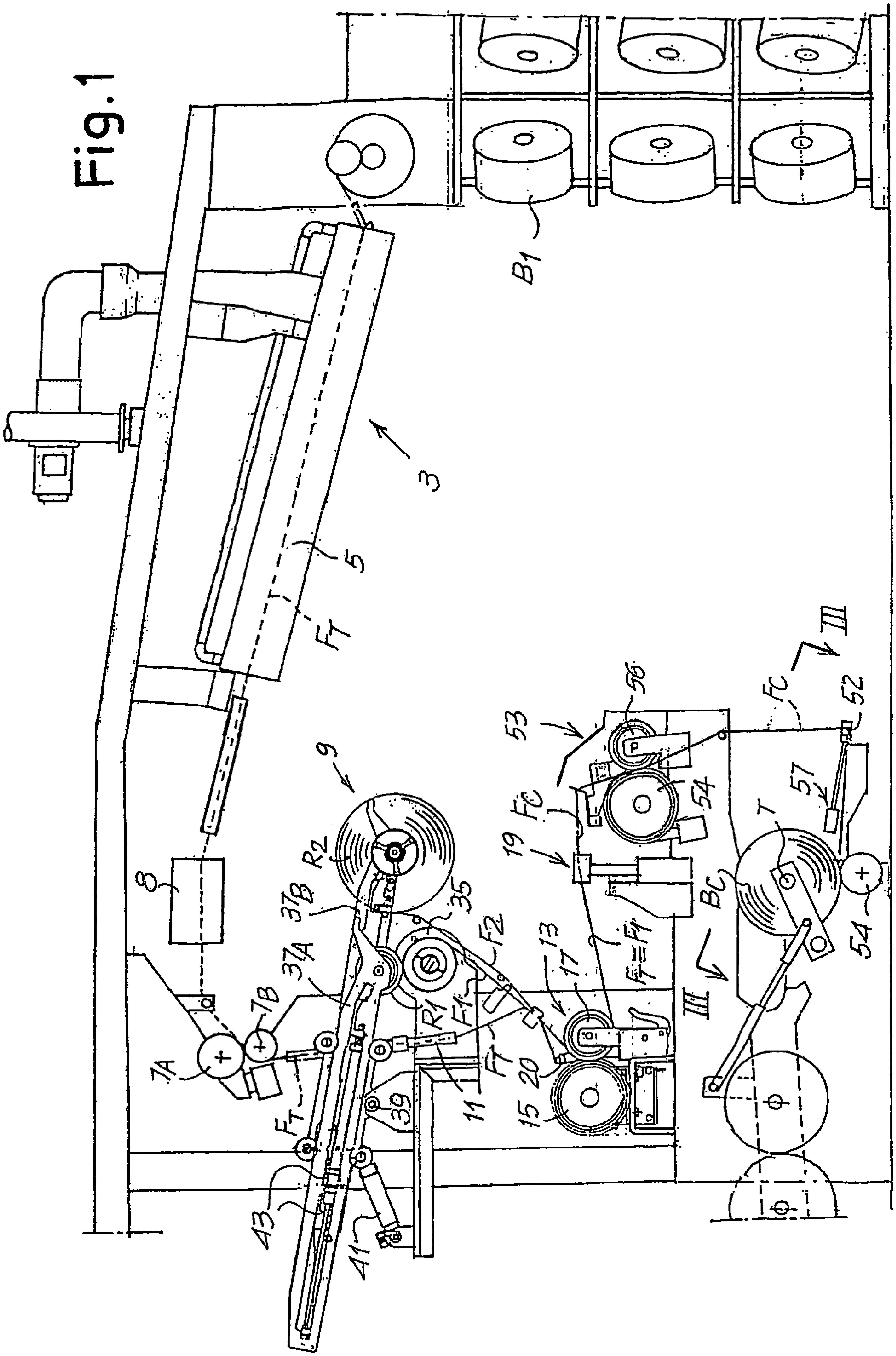
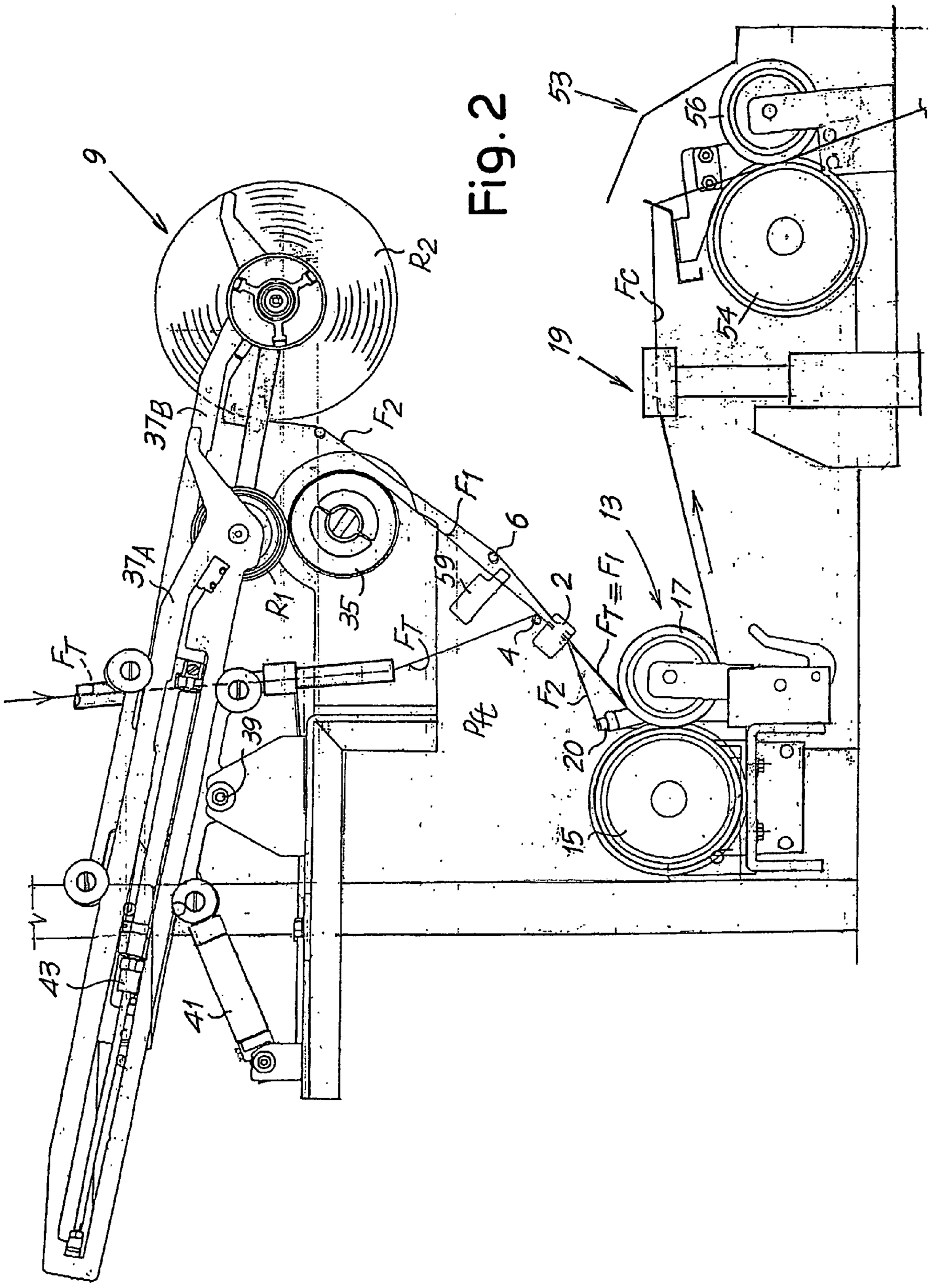

B1
3
5
FT
9
8
R2
37B
35
37A
7B
7A
R1
F1
F2
11
FT
39
43
41
13
17
20
15
19
FC
53
56
54
F=F1
BC
T
57
52
FC
III
III
54

Fig.2


9
R2
37B
F2
F1
6
13
37A
R1
35
39
2
F1≡F1
17
F1
4
F2
Pfc
20
39
Fc
54
19
15
43
41

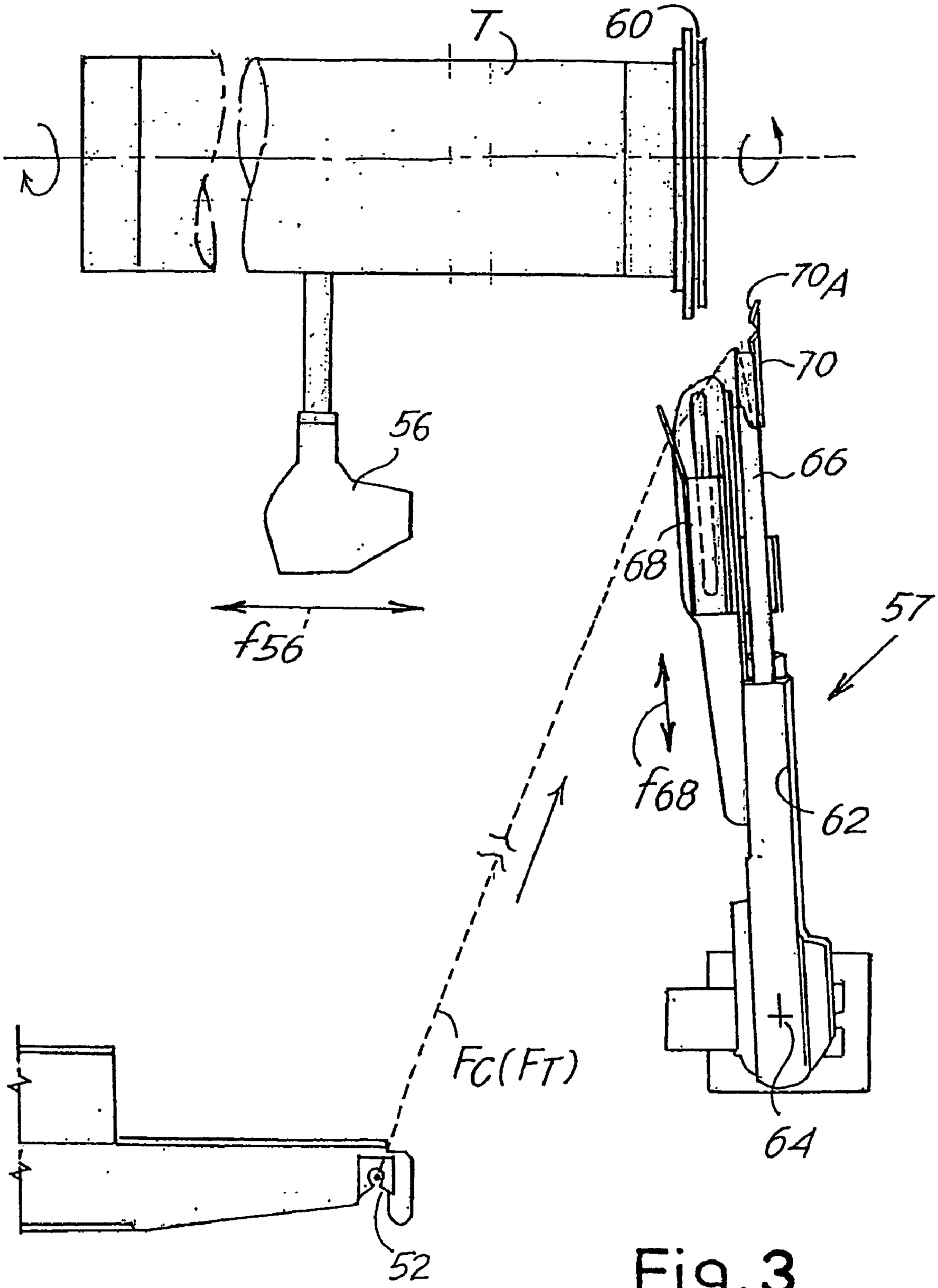


Fig.3

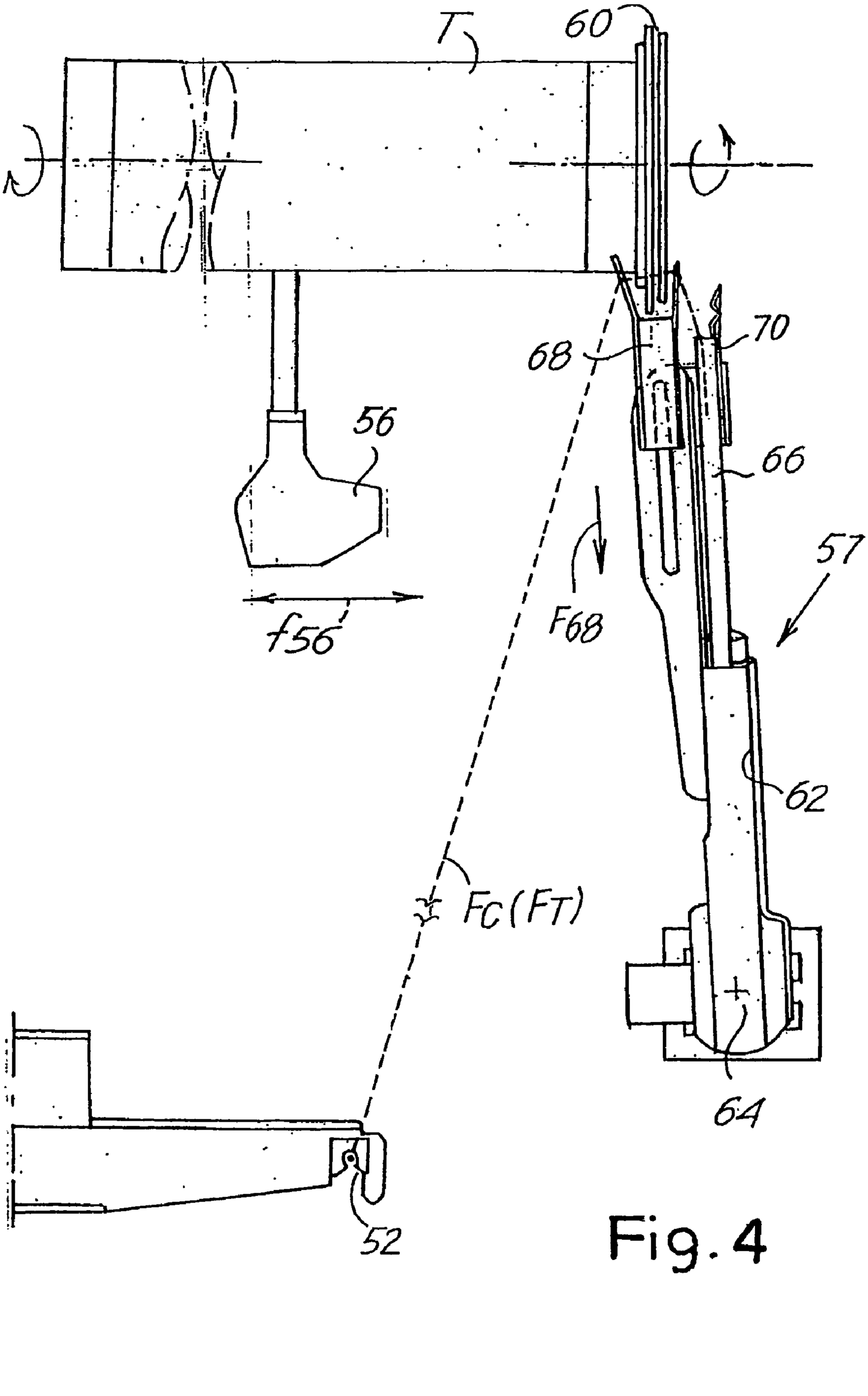


Fig. 4

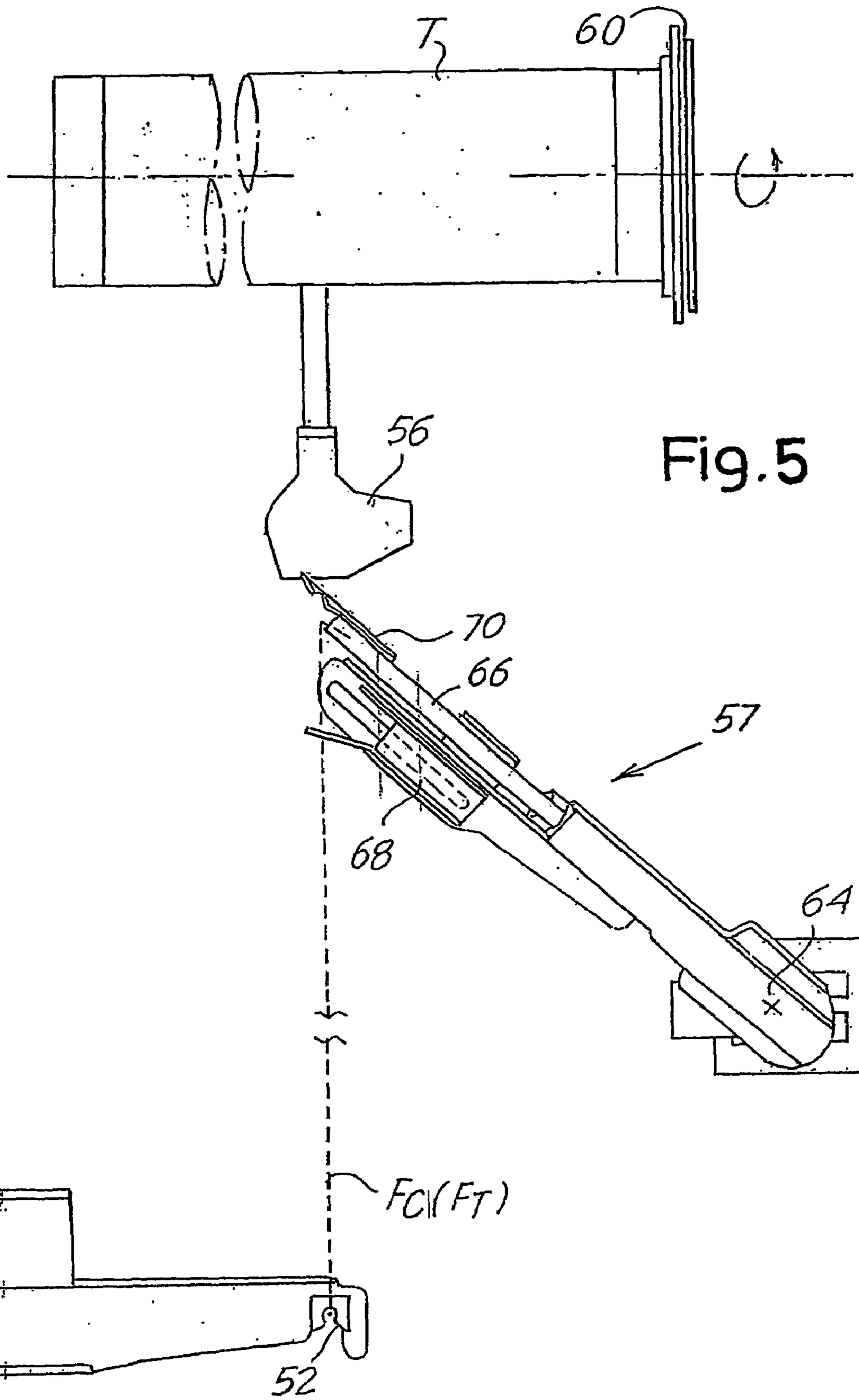
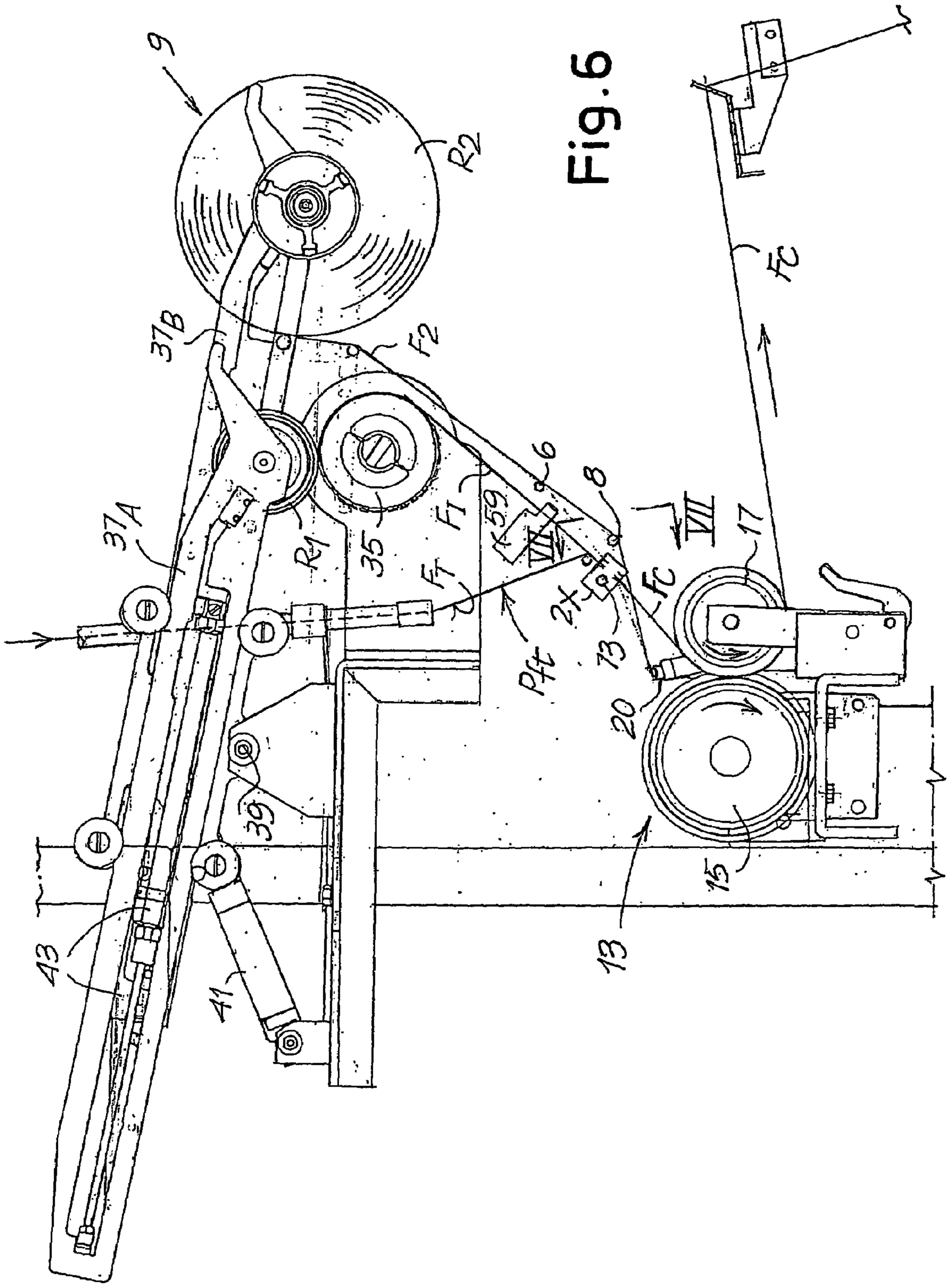


Fig.5

Fig.6


9
R2
37B
F2
37A
R1
35
F1
59
6
8
VII
VII
17
Ft
Pft
2
Fc
13
20
39
15
43
41
13

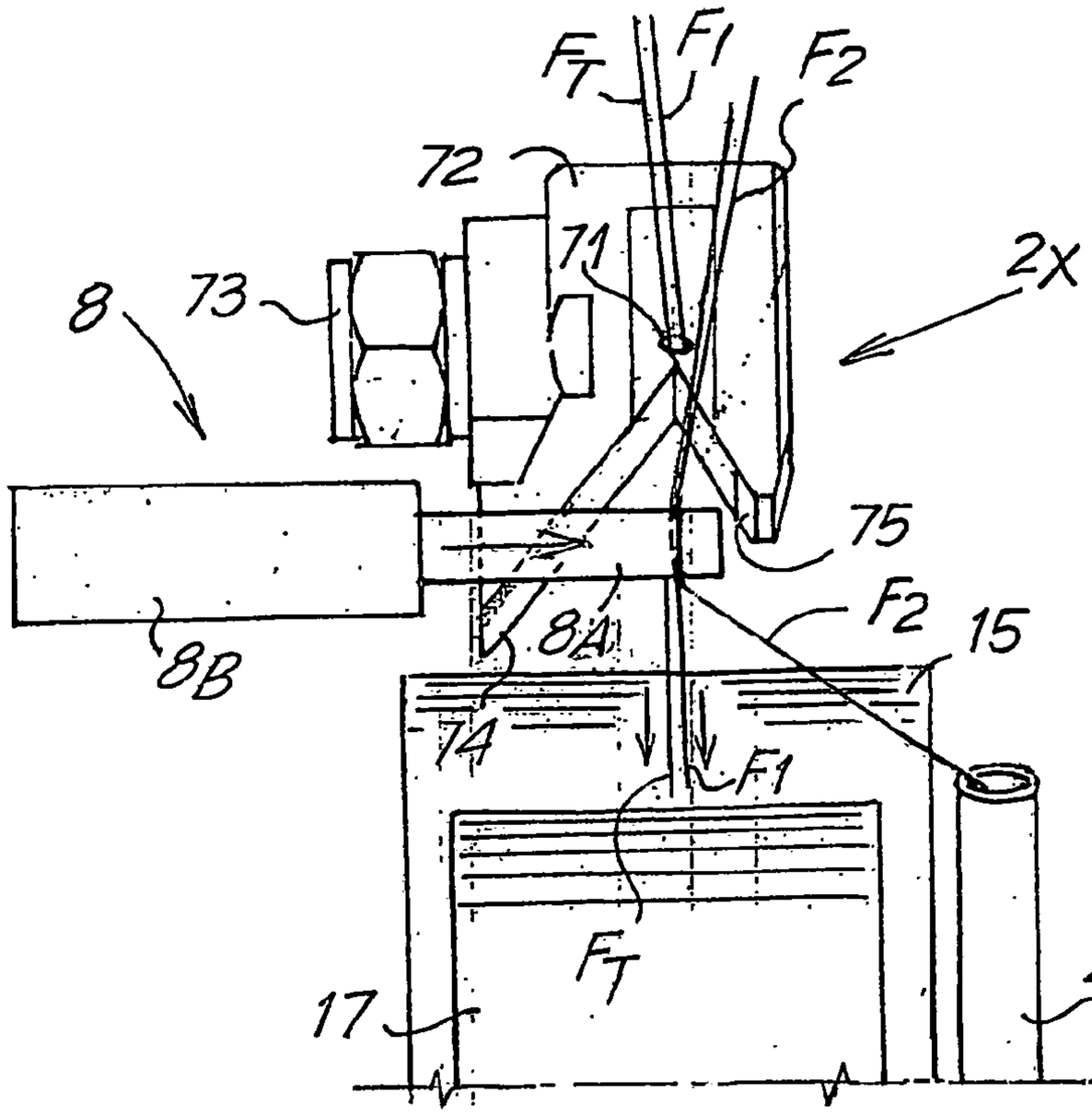

F1
F2
72
71
2X
8
73
75
F2
15
8A
8B
74
F1
FT
20
17

Fig.7A

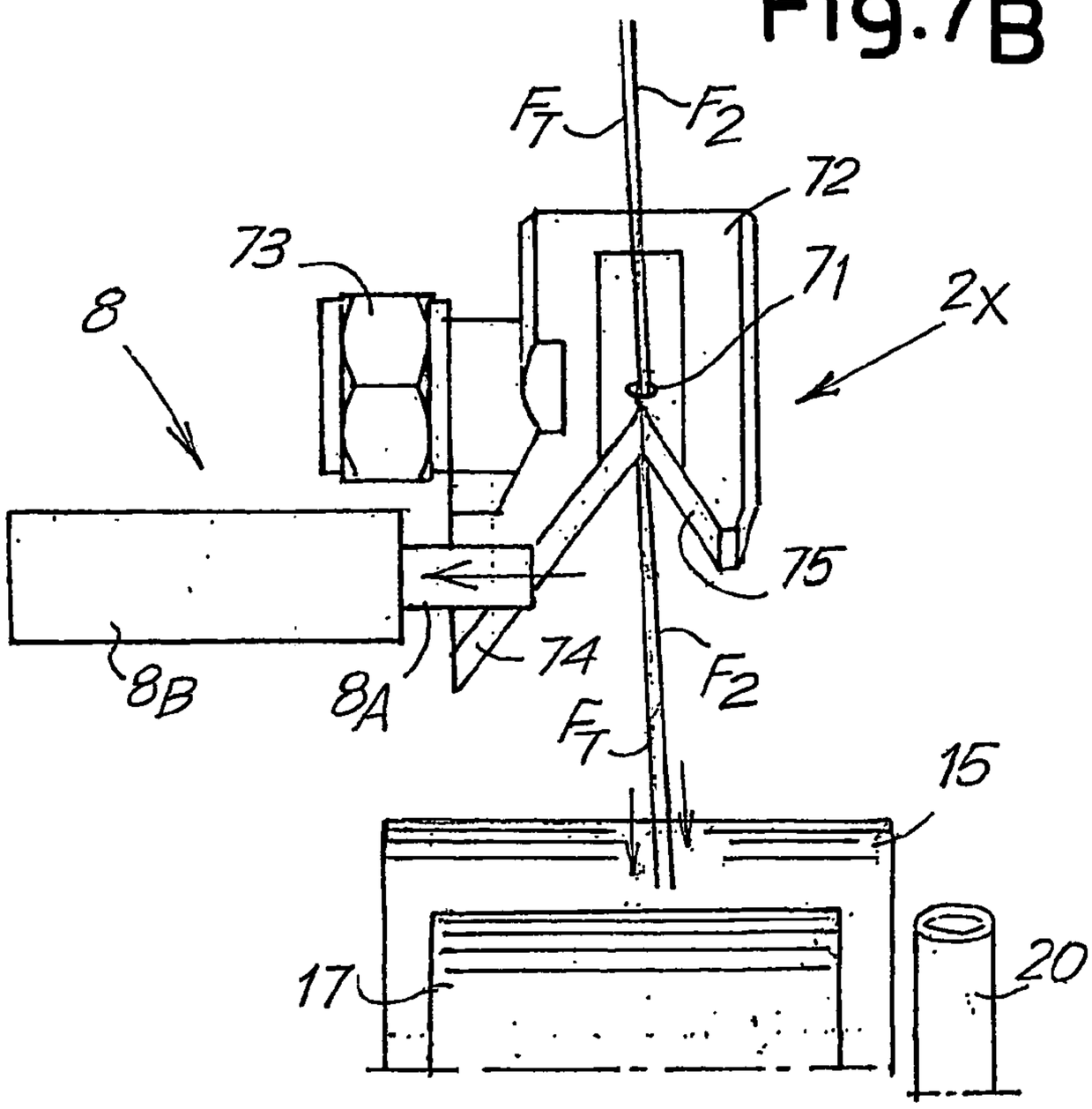

FT
F2
72
73
71
2X
8
75
74
F2
8B
8A
FT
15
17
20

Fig.7B

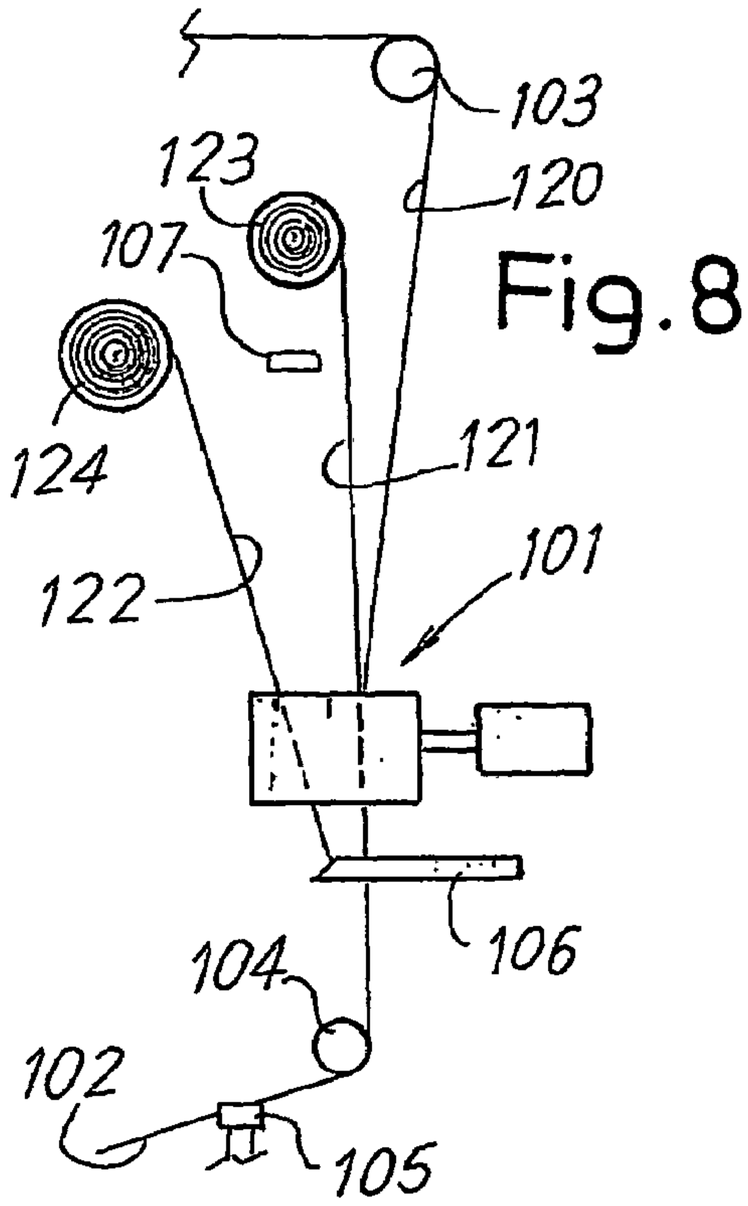


Fig.8

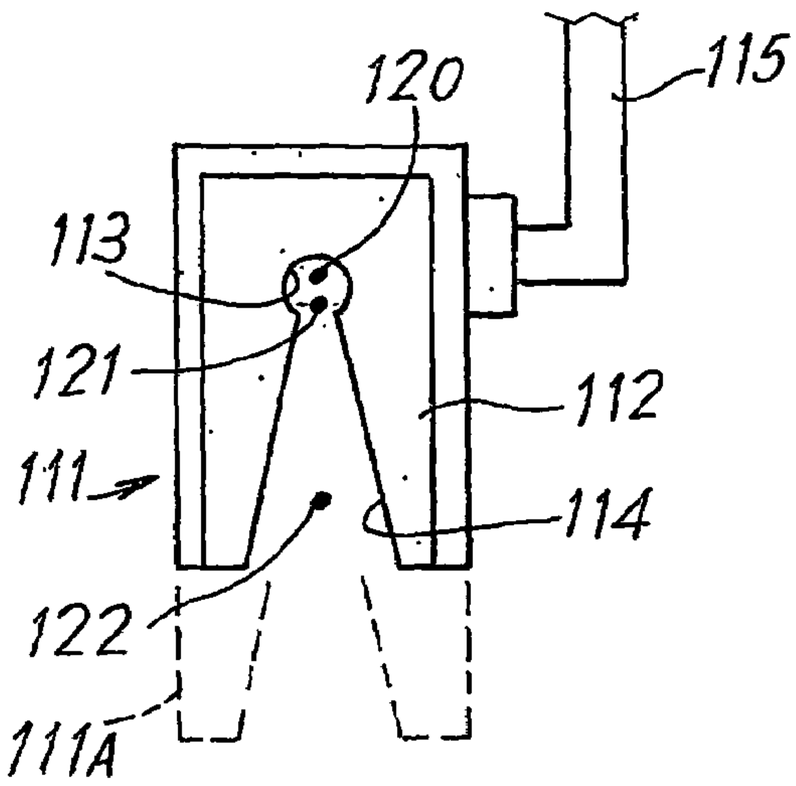


Fig.10

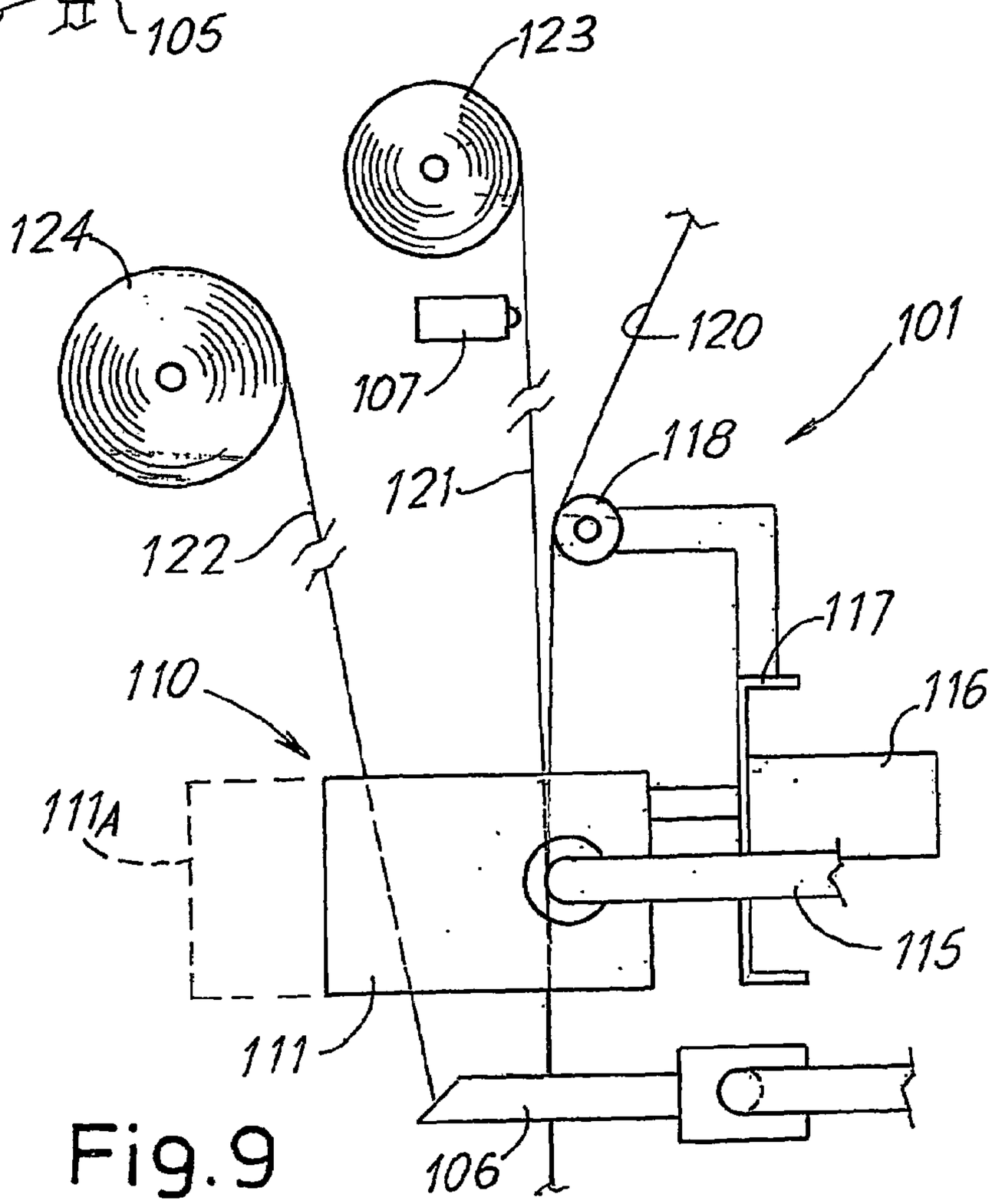


Fig.9

METHOD AND DEVICE FOR THE PRODUCTION OF A COVERED ELASTIC YARN AND FOR AUTOMATIC REPLACEMENT OF FEEDS SPOOLS

TECHNICAL FIELD

The present invention relates to a method and a device for the production of a composite yarn of the type comprising a core part, consisting of at least one elastic yarn, and an external coating, consisting of at least a covering or coating yarn, for example, an essentially non-elastic yarn or in any case a yarn with less elasticity than the core yarn.

More specifically, the invention relates to a method and a device that allows the spools of elastic yarn to be replaced in an automatic, simple and reliable way when they are finished or nearly finished.

STATE OF THE ART

Composite elastic yarns, consisting of an inner elastic yarn, such as a single filament yarn, made of Lycra®, Elastan, other polyurethane fibers or the like, are frequently used in the production of fabrics and particularly knitwear, such as hosiery. The elastic yarn is covered by a less elastic yarn, which may be considered essentially non-elastic, such as a Nylon®, or other polyamide, polyester or equivalent, typically with a multiple filament structure, that is, consisting of a plurality of strands. This yarn will henceforth be indicated as covering yarn as it is used to form a sort of coating or covering of the elastic yarn.

The coating of the elastic yarn may be obtained by means of a covering process in which the elastic yarn is coated with a helical winding of covering yarn. This process is extremely costly and slow.

A new process of coating or covering elastic yarns has recently become popular. This process, known as interlacing or air covering, consists in using a pneumatic device, commonly called interlacing jet, with a conduit through which the two covering and elastic yarns pass. A pressurized air nozzle delivers a jet of compressed air inside the conduit. The turbulence produced inside the conduit causes interlacing of the covering yarn around the elastic yarn. Devices and methods based on this technology are described in U.S. Pat. No. 6,393,817, U.S. Pat. No. 5,008,992, U.S. Pat. No. 4,829,757 and U.S. Pat. No. 3,940,917.

This technology uses pneumatic systems originally developed for processing multiple filament threads to increase bulk and simultaneously combine the single filaments of which they are composed. Examples of interlacing jets developed for this application and which can be used to interlace elastic or elastomer yarns with covering or coating yarns are described in U.S. Pat. No. 5,970,593, U.S. Pat. No. 5,146,660, U.S. Pat. No. 5,010,631, U.S. Pat. No. 4,430,780, EP-B-564400 and JP-A-3279437.

The spools of elastic or elastomer yarn used in systems for the production of covered elastic yarn contain much less yarn than that of the spools or cops of covering yarn. Typically, the elastic yarn on one spool is sufficient to produce a single cop of composite yarn, while the covering yarn wound on one cop is sufficient to make several cops of composite yarn. This makes it necessary to change the spools of elastic yarn frequently, between two subsequent covering or coating yarn cop changes. Replacement is manual. In a system generally equipped with a plurality of individual heads, each producing a cop of composite yarn, end-of-yarn sensors are provided to interrupt head operation when the respective spool of elastic yarn is finished. The operator must manually replace the finished spool of elastic yarn, and insert the free end of the new elastic yarn into the interlacing jet to start the winding cycle of a new cop of composite yarn. In manual systems, the operator must also replace the completed cop with a new tube on which the new composite yarn is wound. The delivery of covering yarn is interrupted during this operation.

This operating method has considerable drawbacks. Firstly, there are noteworthy downtimes, as a single operator monitors a large number of working heads and therefore considerable time may elapse between the spool of elastic yarn finishing and the operation of the operator that allows the head to start the subsequent winding cycle. Furthermore, specifically to avoid excessive machine downtimes, in some cases the spools of composite yarn may be replaced before they are completely finished. The residual yarn cannot be used. This means that a considerable amount of elastic yarn is wasted, representing a significant drawback in view of the high cost per unit of length of this material.

On the other hand, it is not possible for the operator to prepare a spare spool of composite yarn in advance and join the head or initial free end of the yarn of the spare spool to the tail of the yarn on the spool being processed, which would allow spool change to be prepared well before it ended and also to use up the entire spool being processed. This operation is not possible due to the fact that the spools of elastic yarn are not unwound holding them stationary, but must rotate about their axis to deliver the yarn wound thereon. Consequently, it is impossible for the operator to grasp the end or tail of the spool being processed and join it to the initial end of the yarn on the spare spool. This problem does not occur when replacing cops of covering yarn as the cops are unwound without rotating them about their axis. This allows head-to-tail joining of the yarns wound on cops intended to be unwound in sequence, ensuring continuous feed of the covering yarn. Furthermore, the cops of covering yarn contain a large amount of yarn and therefore joining operations are carried out at considerable intervals from one another.

Covering yarn texturing devices are provided between the yarn delivery cop and the interlacing jet in some systems (see U.S. Pat. No. 6,393,817 and U.S. Pat. No. 5,008,992 in particular). The texturing devices include an oven through which the covering yarn travels. This means that the yarn must be fed continuously. In fact, even temporary stopping of the yarn in the oven would cause the destruction or unacceptable damage thereof. When the head is stopped, even for only a short time, so that the operator can replace the finished spool of elastic yarn, the covering yarn must be cut upstream of the texturing section, that is, upstream of the oven. When the composite yarn forming head can start again, as the operator has completed the operations required to replace the spool and inserted the free end of the elastic yarn into the interlacing jet, he must re-thread the covering yarn through the entire path from the cop to the interlacing jet. This entails a lengthy downtime and therefore causes loss of production. The problem can only be prevented if the operator is capable of acting promptly to replace the spool of elastic yarn before the machine automatically cuts the covering yarn. As a large number of heads, which cannot be synchronized, are monitored by a single operator, it is never possible to act promptly enough on all heads in the system. Employing a higher number of operators, on the other hand, would involve an unacceptable increase in labor costs.

OBJECTS AND SUMMARY OF THE INVENTION

The object of the present invention is to provide an efficient and reliable method for automatic replacement of the spools of elastic yarn in devices for the production of covered elastic yarn, that is, composite yarn comprising an elastic core and a coating formed by one or more covering yarns.

According to a different aspect, the object of the present invention is to provide a device for the efficient and reliable continuous production of cops of composite yarn with automatic replacement of the elastomer spools without requiring to interrupt the covering yarn.

Essentially, according to a first aspect a method is provided comprising the phases of:

feeding the covering yarn in an essentially continuous way along a feed path, through at least a first interlacing jet

delivering a first elastic yarn from a first spool through the first interlacing jet;

covering the first elastic yarn with said covering yarn to form the composite yarn and winding the composite yarn on a cop;

preparing a second spool of a second elastic yarn in a stand-by position;

withholding an initial portion of said second elastic yarn in proximity to said first interlacing jet;

when delivery of the first elastic yarn is interrupted, replacing the cop of composite yarn with a new tube;

releasing said initial portion of the second elastic yarn;

joining said covering yarn and said second elastic yarn using the first interlacing jet;

resuming production of the composite yarn covering the second elastic yarn with said covering yarn and winding the composite yarn on said new tube.

In a possible embodiment, the first interlacing jet is movable with respect to the yarns, such that joining of the covering yarn and the second elastic yarn by means of the first interlacing jet is obtained by moving the interlacing jet towards the second elastic yarn. The initial free end of the second elastic yarn is withheld by a retaining member while the second elastic yarn is in a stand-by position. When the second elastic yarn shall replace the first elastic yarn, the first interlacing jet is moved toward the second elastic yarn which enters the jet and is released from said retaining member.

In a further advantageous embodiment of the method according to the invention, the initial free end of the second elastic yarn is withheld by a retaining member, and the initial portion of the second elastic yarn can be engaged by a deflecting element. The latter is controlled to release the initial portion of the second elastic yarn when feed thereof towards the interlacing jet is required to start.

The deflecting element can be designed to withhold the second elastic yarn out of the first interlacing jet, while the second elastic yarn is disposed to be automatically inserted into said first interlacing jet when it is released from said deflecting element. Advantageously, the second elastic yarn can be inserted into the first interlacing jet through the effect of the tension exerted by the retaining member.

In a different embodiment, the second elastic yarn is inserted into the first interlacing jet and withheld therein, standing by for interruption of the first elastic yarn.

In a possible embodiment of the method according to the invention, when delivery of said first elastic yarn is interrupted, the first interlacing jet is temporarily made to stop operating while the covering yarn continues to be fed therethrough; after the second elastic yarn from the second spool starts to be delivered through the first interlacing jet, said first interlacing jet is re-activated to join the second elastic yarn to said covering yarn and resume production of said composite yarn. In this case a single interlacing jet is used both to produce the composite yarn and to start feeding the elastic yarn of the second spool. The second elastic yarn can already be standing by inside the first interlacing jet when feed of the first elastic yarn is interrupted.

In a different embodiment, the elastic yarn is instead covered with the covering yarn by a second interlacing jet, disposed downstream of the first interlacing jet along the path of the covering yarn. In this case the first interlacing jet has the sole function of constraining the second elastic yarn to the covering yarn when the empty spool is replaced with the new spool of elastic yarn. Therefore, the first jet can be activated only in the exchange phase and remains inoperative during the production of composite yarn by the second jet.

According to a different aspect, the invention relates to a method comprising the phases of:

(a) continuously feeding from the running machine or with the machine stopped a covering yarn to an air jet interlacing device;

(b) simultaneously feeding to said interlacing device a first elastomer yarn being unwound from a first spool, disposed in a working position, so as to obtain interlacing of said covering yarn with said elastomer yarn;

(c) withholding the free end of a second elastomer yarn, wound on a second spool, disposed in a stand-by position in a retaining area;

(d) detecting interruption of feed of said first elastomer yarn, to control, in appropriate time relationship, transfer of said second spool of elastomer yarn to said working position and transfer of said first spool of elastomer yarn to said stand-by position;

characterized in that includes the additional phases of:

(e) performing a relative movement of said covering yarn with respect to said second elastomer yarn, in proximity to said retaining area of said free end of the second elastomer yarn, so as to come into contact with said second elastomer yarn;

(f) associating said second elastomer yarn with said covering yarn using an air jet, simultaneously releasing said free end of the second elastomer yarn, to resume feed of said yarns to said interlacing device.

According to a different aspect of the invention, a device is provided for the production of a composite yarn formed by at least an elastic yarn covered with at least a covering yarn, comprising in combination: a first interlacing jet; a feed path of said covering yarn and a feed path of said elastic yarn towards said first interlacing jet; supporting means for spools of elastic yarn; winding members to wind the composite yarn on a cop being formed; an interruption device to interrupt feed of the composite yarn to said cop being formed and start winding the composite yarn on a new winding tube. Characteristically, said supporting means for the spools of elastic yarn are suitable to support at least a first spool of elastic yarn and at least a second spool of elastic yarn. Moreover, associated with said first interlacing jet are a retaining member to withhold an initial free end of the elastic yarn of said second spool. Also provided are a sensor to detect interruption of feed of the first elastic yarn to the first interlacing jet and a control to control release of the initial portion of the second elastic yarn when interruption of feed of the first elastic yarn is detected.

The retaining member can advantageously be a suction member.

According to a possible embodiment, means are provided to move one with respect to the other the first interlacing jet and the initial portion of the second elastic yarn when the latter is in a standby position. The second elastic yarn thus enters the first interlacing jet when the first elastic yarn has been interrupted.

According to a further embodiment, associated with the first interlacing jet is also a deflecting element to withhold an initial portion of the second elastic yarn during delivery of the first elastic yarn to the first interlacing jet.

According to a possible embodiment, the retaining member and the deflecting element are disposed, with respect to the first interlacing jet, so as to withhold the second elastic yarn out of the first interlacing jet. Moreover, the retaining member is designed and arranged to tension the second elastic yarn causing insertion thereof into the first interlacing jet when the deflecting element releases said second elastic yarn.

Further advantageous features and embodiments of the device and of the method according to the invention are indicated in the appended claims and shall be described in greater detail hereunder with reference to some exemplary embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention shall now be better understood following the description and accompanying drawing, which shows practical non-limiting and exemplary embodiments of the invention. In particular, in the drawing:

FIG. **1** shows a side view of the device complete with the texturing area of the covering yarn;

FIG. **2** shows a side view of a portion of the device;

FIGS. **3**, **4** and **5** show, in various arrangements, a view according to III-III in FIG. **1** of the winding area of the cop of composite yarn;

FIG. **6** shows a side view similar to the view in FIG. **2** of a modified embodiment;

FIGS. **7**A and **7**B show an approximate front view of the first interlacing jet in two operating conditions;

FIGS. **8**, **9** and **10** diagrammatically show a further embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

A first embodiment of the invention is shown in FIGS. **1** to **5**.

FIG. **1** shows a side view of a system comprising a plurality of winding heads to produce cops of composite yarn with a series of devices according to the invention. Only one head is shown in the figure, the others being aligned orthogonally to the plane of the figure.

The number **1** generically indicates the area in which the cops B**1** of covering yarn, for example polyester, nylon or other equivalent yarns, typically a multiple filament yarn, are located. The yarn unwound from a cop B**1** is fed through a texturing section of conventional type, known per se and indicated with **3**. The texturing area has a heating oven **5**, a cooling area **6**, an area **8** for the false-twisting operation, and terminates with a first pair of rollers **7**A, **7**B to pick up or feed the textured covering yarn FT, which is fed to an area **9** in which the spools of elastic yarn, the interlacing jet, the actual winding head and all the members required to change the spools of elastic yarn are located. With the exclusion of the winding head, this area is shown in greater detail in FIG. **2**.

In the area **9** the yarn FT passes through an oven **11** (to stabilize the yarn) and along its feed path Pft reaches an interlacing jet wherein it covers the elastic yarn F**1** or F**2** fed from one or other of the two spools R**1**, R**2** carried by supporting means as described below.

A first interlacing jet **2** is disposed along the path Pft, for the purpose of joining the elastic yarn of a new spool to the textured covering yarn FT when a finished spool R**1** is replaced with a new spool R**2** of elastic yarn, according to a procedure to be described below. In the arrangement in FIG. **2**, the interlacing jet **2** is normally inoperative and is only operated during the phase to start unwinding a new spool of elastic yarn. The inlet of the interlacing jet **2** is oriented in a direction slanted with respect to the direction from which the yarn FT is fed, so that it is guided inside the interlacing jet **2** by means of a fixed guide element **4**, such as a ceramic thread guide with a low coefficient of friction.

Disposed downstream of the first interlacing jet **2** is a stretching area **13**, in which a stretching unit or feed unit is provided, formed by a second pair of rollers **15**,**17**, the first of which is driven and the second is idle, forming a nip through which the yarns are fed. The peripheral speed of the rollers **15** and **17** and the peripheral speed of the pair of rollers **7**A, **7**B are coordinated with each other to apply stretch or to relax the elastic and covering yarns.

Disposed downstream of the stretching unit **15**, **17**, is a second interlacing jet, indicated as a whole with **19**, which may be of a type known per se, and which—in this embodiment—is the process jet, that is, the one that coats the elastic yarn by means of the covering yarn.

A first elastic yarn F**1**, unwound from a first spool R**1** of elastic yarn is fed through the nip defined by the stretching rollers **15**, **17** forming the stretching unit **13**. The spool R**1** is unwound by a driven unwinding roller **35** with which it is in contact. The speeds of the unwinding roller **35** and of the rollers **15**, **17** are adjustable to apply the required degree of stretch to the yarn F**1**. Moreover, the speed of the rollers **15**, **17** can be adjusted with respect to the speed of the pair of rollers **7**A, **7**B to apply a degree of stretch to the yarn FT which is either equal to or different than the stretch applied to the yarn F**1**, or also to slacken the yarn FT. The yarn F**1** fed from the spool R**1** passes through the first interlacing jet **2** adjacent to the textured covering yarn FT. As the jet **2** is inoperative during normal feed of the two yarns FT and F**1**, it has no action on these yarns.

The spool R**1** is supported by an arm **37**A oscillating about an axis **39** orthogonal to the plane of the figure. In addition to the oscillating movement, controlled by a piston-cylinder actuator **41**, the arm **37**A is provided with a translating movement in a direction parallel to the longitudinal extension of the arm, controlled by a further piston-cylinder actuator **43**. A further arm **37**B, essentially the same as the arm **37**A, is hinged on the same axis **39**, and its oscillating movement about the axis **39** is controlled by a further piston-cylinder actuator, not visible and hidden from view in FIG. **2** by the actuator **41**. The arm **37**B is also provided with a translating movement parallel to the longitudinal extension thereof, controlled by an actuator similar to the actuator **43** and not visible in the figure.

The oscillating arm **37**B supports a second spool R**2** on which a second elastic yarn F**2** is wound. The spool R**2** is (in the arrangement in FIG. **2**) in a standby position to replace the spool R**1** when the latter is finished. The position of the two arms **37**A, **37**B can be exchanged thanks to the oscillating and extending/retracting movements of the arms obtained with the actuators **41**, **43**.

The yarn F**2** is prepared along a standby path which extends downwards from the spool R**2** through the first interlacing jet **2** to a retaining member **20**, which has a suction

mouth, inside which the head or free end of the second elastic yarn F**2** is inserted. A mechanical retaining system can be associated with the mouth of the retaining member **20**, so that during standby before replacing the yarn F**1** with the yarn F**2**, suction through the mouth can be deactivated and the free end of the yarn F**2** is withheld only mechanically. During exchange of the two spools R**1** and R**2** the yarns F**2** will, instead, be sucked by the mouth for reasons which shall later become apparent.

The retaining member **20** is adjacent to the pair of rollers **15**, **17** and positioned rearwards with respect to the roller **17**, that is, on the opposite side—with respect to the spool R**2**—of a vertical plane containing the axis of the roller **17**.

Along its path from the spool R**2** to the retaining member **20** the second elastic yarn F**2** rests on a deflecting element **6** provided with a movement orthogonal to the plane in FIG. **2**. The deflecting element can consist of a cylinder made of ceramic or another material with low coefficient of friction, connected to the rod of a piston-cylinder actuator. Retraction of the rod of the piston-cylinder actuator releases the second elastic yarn F**2** from the deflecting element **6** when the finished spool R**1** must be replaced with the spool R**2**, or when the yarn F**1** breaks and must be replaced with the yarn F**2**.

The deflecting element **6** withholds the second elastic yarn F**2** standing by out of the range of action of a sensor **59**, disposed along the path of the elastic yarn F**1**, between the spool R**1** and the first interlacing jet **2**. The sensor **59**, for example an optical sensor, detects passage of the elastic yarn F**1** and provides a signal to start the cycle to replace the spool R**1** with the spool R**2**, when delivery of the yarn F**1** from the spool R**1** is interrupted. By keeping the yarn F**1** out of the range of detection of the sensor **59**, this prevents operation of said sensor from being disturbed.

Downstream of the stretching unit **15**, **17** the two yarns F**1** and FT follow a common path to the second interlacing jet **19**, inside which, in a way known per se, the elastic yarn F**1** is covered with the yarn FT to form a composite or interlaced yarn FC.

Downstream of the interlacing jet **19** this composite yarn FC reaches the nip of a feed unit **53** formed by a third pair of rollers, consisting of a driven roller **54** and an idle roller **56**. The peripheral speed of the rollers **54**, **56** is connected to the speed of the rollers **15**, **17** of the unit **13**, so that the yarns F**1** and FT and the yarn FC which are between these two pairs of rollers are subjected to the desired degree of relaxing and/or stretching.

Downstream of the feed unit **53** the yarn FC is deflected and guided by a fork **52** and reaches a winding area, indicated as a whole with **55**, where it is wound on a winding tube T to form a cop BC of composite yarn. Positioned in the winding area **55** are mechanisms, known per se and not described herein, which automatically unload the cops BC as they are completed and replace each completed cop BC with a new winding tube T. The number **57** generically indicates a device which: interrupts the composite yarn FC at the end of winding a cop BC; withholds, with a suction mouth, the yarn which continues to be delivered during the phase to replace the cop BC with a new winding tube T and to replace the spool of elastic yarn R**1** with the spool R**2**; and resumes winding of the yarn FC on the new winding tube f. The device **57** is shown in greater detail in the views in FIGS. **3**, **4** and **5**, which represent it in three different operating positions, according to III-III in FIG. **1**.

In FIG. **3** the device **57** is shown in standby position before starting to wind a new cop BC of interlaced yarn FC. The reference T indicates the tube which is used for winding and **60** indicates a ring, known per se, coaxial to the tube T and used to start winding the yarn on the tube. The tube T and the cop BC being formed thereon are made to rotate by a driven roller **54** positioned underneath (see FIG. **1**), to ensure a constant peripheral speed as the diameter of the cop being formed varies. The number **56** indicates a thread guide or "traverse device" which with an alternating oscillating or translating movement according to the double arrow f**56** distributes the turns of yarn on the tube T and on the cop BC being formed thereon.

The device **57** includes an arm **62** hinged about an axis **64** approximately orthogonal to the plane in FIGS. **3**, **4**, **5** and which carries a frontally open suction conduit, indicated with **66**, a fork **68**, with a translating movement according to f**68** along the arm and parallel to the suction conduit **66**, and a guiding member **70** integral with the conduit **66**, to draw the yarn towards the mouth of the suction conduit **66**.

In the arrangement shown in FIG. **3**, the yarn FC is sucked into the conduit **66**. In this phase, the yarn may actually be composed only of the covering yarn FT and not of the interlaced yarn FC, as the elastic yarn F**1** or F**2** previously delivered from the corresponding spool R**1** or R**2** finishes in this phase, while the yarn FT is continuously fed even if the elastic yarn F**1** or F**2** is missing. However, as mentioned above, if the cop BC is replaced with a new winding tube T before the spool R**1** or R**2** of elastic yarn finishes (as the spool has enough yarn to produce, for example, two cops of composite yarn FC), in the phase to replace the cop BC with the tube T the device will suck composite yarn inside the conduit **66** until the new winding operation starts up.

After the yarn F**1** (finished or broken) has been replaced with the yarn F**2** (in the manner described in greater detail below) and the interlacing jet has started to produce composite yarn FC with the yarn F**2** covered by the yarn FT, the interlaced or composite yarn FC can start to be wound on the new tube T, which for this purpose is rotated about its axis.

By means of the fork **68**, the yarn FC is drawn adjacent to the ring **60**, which rotates integrally with the tube and grips the yarn to wind it around said tube. The phase to draw the yarn FC adjacent to the ring **60** is shown in FIG. **4**. While the yarn forms the first winding turn on the tube T, a blade (not shown) cuts the yarn to separate it from the portion thereof which is inside the suction conduit **66**. This produces a free end of yarn which remains anchored to the tube through the effect of winding. By continuing to wind the yarn FC delivered to the tube T thereon, the path of the yarn FC between the guiding fork **52** and the tube T is intercepted by the thread guide **56** which engages the yarn and consequently starts to distribute it along the entire axial extension of the tube with an alternating movement according to the double arrow f**56**.

After winding a cop BC on the tube T, the arm **62** is brought to the position shown in FIG. **5** with the guiding member **70** disposed to intercept the path of the yarn FC drawn by the thread guide **56** in the alternating movement thereof. The guiding member **70** has a slanted surface **70**A which, when intercepted by the yarn FC, makes the latter rise to the mouth of the suction conduit **66**. Simultaneously, the yarn FC is cut by a blade (not shown and carried by the thread guide **56**) in an intermediate position between the finished cop and the guiding member **70**. The free end downstream of the cut is wound on the cop BC which is then removed, while the free end upstream of the cut is inserted into the suction conduit **66**, which (as described above) starts to suck the yarn; the yarn continues to be delivered while the spool of elastic yarn is changed and the completed cop BC is replaced with a new tube. From this position, the arm **62** returns to the position in FIG. **3** standing by for a new winding process to start up as

soon as the interlacing jet **19** starts to deliver the completed yarn FC again, that is, after feeding of the new elastic yarn F**2** starts.

Overall operation of the device described above is illustrated below. In the configuration shown in FIG. **2**, the covering yarn FT, textured upstream of the pair of rollers **7**A, **7**B, is fed to the stretching unit **15**, **17** and from here to the interlacing jet **19**. Parallel thereto, the elastic yarn F**1**, delivered from the spool R**1** which is turned by the unwinding roller **35**, is also fed to the stretching unit **15**, **17** and then to the interlacing jet **19**. The composite yarn FC is wound on the cop BC being formed on the winding tube T supported by arms **56** in the winding area **55**. The second elastic yarn F**2** is in standby position with the initial free end engaged by the retaining member **20** and deflected by the deflecting element **6** so as not to interfere with the sensor **59**. The yarns F**1** and FT travel through the first interlacing jet **2**, which is temporarily inoperative.

The phase to exchange the spool R**1** with the spool R**2** and to replace the cop BC with a new tube T is started when the sensor **59** detects that the first elastic yarn F**1** delivered from the spool R**1** has been finished or interrupted. During this phase, the textured covering yarn FT continues to be delivered without interruption, preferably at an essentially constant speed. The sensor **59** can be replaced by another type of sensor, for example, which detects the diameter of the spool R**1** about to finish or the amount of yarn F**1** delivered. A sensor which detects the amount of yarn wound on the cop BC, measured according to weight and/or length, may be combined with the sensor **59** or other equivalent device. This additional sensor may be used to trigger the replacement process even when the yarn F**1** is not finished but the cop BC has been completed.

The following operations are carried out during the exchange phase. The composite yarn FC is cut between the completed cop BC and the device **57**, forming an head or tail end which is completely wound on the cop. The other free end formed by the cut is withheld by the device **57** and sucked by the suction mouth **66** as described above with reference to FIGS. **3**-**5**, and prepared to start the new winding cycle. In this way, the end part of the elastic yarn F**1** and the covering yarn FT, which is still fed continuously, are sucked by the suction mouth and the yarn FT is kept adequately tensioned along the entire path thereof.

The arms **37**A and **37**B, and consequently the finished spool R**1** and the standing-by spool R**2** of elastic yarn, are exchanged so that the arm **37**A with the finished spool R**1** is positioned at a distance from the unwinding or delivery roller **35**, and the arm **37**B carries the spool R**2** into contact with the unwinding roller **35**.

When the arm **37**A has reached the final position with the finished spool R**1** in the appropriate position, the operator can replace the finished spool R**1**, at any moment during the entire unwinding cycle of the spool R**2**, with a new spool of elastic yarn which will subsequently be replaced in the same manner as the spool R**2** when it in turn finishes or when the yarn F**2** is interrupted, for example due to accidental breakage.

Before the spool R**2** starts to deliver yarn by means of the unwinding or delivery roller **35**, suction is activated through the suction mouth of the retaining member **20**, so that when spool R**2** unwinding is activated through rotation of the delivery or unwinding roller **35**, the yarn F**2** starts to accumulate in or be drawn into this mouth. This phase lasts for the minimum time required for the speed of the yarn F**2** to reach approximately the same value as the speed of the textured covering yarn FT, therefore for a relatively short time.

Once the two yarns F**2** and FT, which are already inserted into the first interlacing jet **2**, are moving at approximately the same speed, the first interlacing jet **2** is activated for a short period. The short jet of pressurized air hits the two yarns FT and F**2** in the channel of the jet **2**, causing them to join and the yarns therefore start to move forward together towards the second interlacing jet **19**. The air jet in the interlacing jet **2** can be interrupted when the yarn F**2** has been joined to the yarn FT and is drawn by the latter towards the jet **19**. As soon as the yarn F**2** reaches the second interlacing jet **19** production of the composite yarn FC, by the elastic yarn covered with the covering yarn FT, resumes. The second interlacing jet **19** can be temporarily deactivated before this happens, to prevent it from acting on the yarn FT passing therethrough.

The deflecting element can be retracted after the replacement cycle has started, that is, after the sensor **59** has detected interruption in the feed of elastic yarn F**1**. In this way the sensor starts to detect passage of the yarn F**2**. When the composite yarn FC reaches the device **57**, this starts winding the yarn FC on a new winding tube T, and the yarn is cut, thereby interrupting suction thereof through the mouth of the suction conduit **66**, as already described in greater detail with reference to FIGS. **3**-**5**.

As is evident from the description above, the device is particularly reliable, thanks to the fact that insertion of the second elastic yarn F**2** into the process takes place in a very simple way with a minimum number of moving parts. In actual fact, the only movement is the deflecting device **6**, which is a very simple member with a reduced volume. Moreover, movement thereof does not require to be perfectly synchronized with exchange of the spools R**1**, R**2**, as its sole purpose is keeping the yarn F**2** out of the range of the sensor **59**, while the yarn F**2** is joined to the yarn FT and inserted into the process jet **18** without the movement of members and in particular without movement of the interlacing jets **2** and **19**. These jets can also be produced in a configuration that does not have controllable opening and closing systems for yarn insertion.

In the exemplary embodiment described above, reference was made to a machine or device provided with three pairs of feed rollers **7**A, **7**B; **13**, **15** and **54**, **56**. Nonetheless, according to a different embodiment of the device, the pair of rollers **54**, **56** can be eliminated, as can one of the two interlacing jets. A solution of this type is illustrated in FIG. **6**, where the central part of the device, is shown, similarly to FIG. **2**, while the remaining parts remain essentially unchanged with respect to what is described with reference to FIGS. **1** to **5**.

In FIG. **6**, the same numbers indicate parts the same as or equivalent to those in the previous figures. The interlacing jet **19** has been eliminated and only the first interlacing jet, indicated with **2**X, remains along the path of the yarns, which here performs the dual operation of joining the yarns F**2** and FT and covering the elastic yarn F**1** or F**2** with the yarn FT.

To prevent the second elastic yarn F**2**, standing by to replace the first elastic yarn F**1** being processed, from interfering with operation of the jet **2**X and with operation of the sensor **59**, in this case the initial portion of the yarn F**2** is withheld by a double deflecting element **6**, **8**. This element can consist of a pair of piston-cylinder actuators, with two deflecting members coated in a material with low coefficient of friction (typically a ceramic material) associated with the rods of the piston. The arrangement of the two deflecting members is such that by engaging the free end of the yarn F**2** with the retaining member **20** and positioning the deflecting members in their active position, the initial portion of the yarn F**2** is in front and out of the interlacing jet **2**X. It would also be possible to use a single deflecting element **8**, suitably posi-

tioned to hold the yarn F1 standing by out of the detection range of the sensor **59**, and out of the inner channel of the interlacing jet **2**X.

When the sensor **59** detects interruption of the first elastic yarn F**1**, it enables starting of the replacement cycle. As in the previous case, the covering yarn FT continues to be fed, essentially at the same speed, through the interlacing jet **2**X, which may be deactivated for a part of or for the entire cycle to replace or exchange the yarns F**1** and F**2**. The cop BC of composite yarn FC is replaced with a new tube T, while the covering yarn FT is accumulated by the suction mouth associated with the winding system of the cops BC. The position of the arms **37**A, **37**B is exchanged, or more precisely the arm **37**B is carried with the spool R**2** in contact with the unwinding or delivery roller **35**, while the arm **37**A is placed in a position in which the operator can easily replace the finished spool R**1** with a new spool.

Once the new tube T is in position and is turning (or even slightly before this moment) start-up of feed of the yarn F**2** is enabled. The mouth of the retaining member **20** sucks the yarn F**2**, while with a coordinated movement the deflecting element **6**, **8** is taken to the retracted position, so that the yarn F**2** enters the detection range of the sensor **59** and the interlacing jet **2**X and the latter is activated. Synchronization of the various operations is such that the new elastic yarn F**2** is engaged with the covering yarn FT and, through the jet **2**X, combined feed of the yarns F**2** and FT and, consequently, production of the composite yarn FC, starts.

In this second solution, the device is further simplified through elimination of the third feed unit **53**, with its rollers **54** and **56**. The effect of stretching and/or relaxing on the yarns being processed is obtained by coordinating the feed speeds of the feed unit **7**A, **7**B, of the feed unit **13** formed of the rollers **15**, **17** and of the unwinding or delivery roller **35**. More specifically, the elastic yarn F**1** or F**2** is stretched between the delivery or unwinding roller **35** and the unit **13**, setting the peripheral speed of the rollers **15**, **17** to a value higher than the peripheral speed of the roller **35**, while the covering yarn FT can be stretched or relaxed by acting on the peripheral speed ratio of the rollers **15**, **17** on the one hand and the rollers **7**A, **7**B on the other.

FIGS. **7**A, **7**B schematically show the interlacing jet **2**X and the deflecting member **8**. The jet **2**X has a channel **71** produced in a block **72**. A pressurized air nozzle fed by a compressed air line **73** is disposed transversely to the channel **72**. In FIG. **7**A the covering yarns FT and the first elastic yarn F**1** are fed through the channel **72**. The second elastic yarn F**2** is in the standby position, with the initial free end engaged in the mouth of the retaining member **20**. A mechanical retaining device (not shown) can be associated with the suction mouth to allow suction to remain inactive, until the phase to exchange the spools R**1**, R**2** starts.

In this standby position the yarn F**2** rests on a ceramic coated rod **8**A of a piston-cylinder actuator **8**B. The similar piston-cylinder actuator, forming the member **6** is not shown in FIG. **7** and is positioned above the sensor **59**. In this way the yarn F**2** is withheld standing by in an inlet area of the jet **2**X, defined by an asymmetrical V-shaped profile, formed by sides **74**, **75**. In the example illustrated, through the effect of the offset position of the retaining member **20**, the yarn F**2** rests on the side **75**. A slit which leads into the channel **71** extends from the vertex of the V-shaped profile.

When the yarn F**2** is to be brought into the process, it is released from the members **6**, **8** (or by the member **8** when the member **6** is not provided) and, through the effect of the tension applied by suction of the mouth associated with the retaining member **20**, it is positioned at the vertex of the V-shaped profile **74**, **75**, passes through the slit therein and from there enters the process channel **71** of the jet **2**X, to take the condition in FIG. **7**B, in which the yarns FT and F**2** are fed through the jet.

The same type of jet can be used as jet **2** in the configuration in FIG. **2**. In this case, the yarns FT and F**2**, on which the jet performs no action, pass through the conduit **71**, while the yarn F**2** is standing by inside said conduit until the yarn F**1** finishes.

It will be understood that in the configuration in FIG. **2** the second elastic yarn F**2** could also be withheld standing by in front of the channel of the jet **2**, with a double deflecting mechanism as in the example in FIG. **6**.

A further embodiment of the invention is shown in FIGS. **8**, **9** and **10**. With particular reference to said figures, number **101** indicates as a whole the device for automatic threading of the elastomer yarn in a machine for the production of interlaced composite yarns **102**, starting from a covering yarn **120** and from an elastomer yarn **121**.

The covering yarn **120** is unwound continuously along a path defined by a series of rollers made to rotate independently by relative spindles, comprising at least a drawing spindle **103** and a stretching spindle **104**, and is fed to an air jet interlacing jet **105**.

The interlacing jet **105** is simultaneously fed continuously with a first elastomer yarn **121**, to obtain interlacing of the covering yarn **120** with the elastomer yarn **121**, thus covering the elastomeric yarn **121** with the covering yarn. The first elastomer yarn **121** is unwound from a first spool **123** prearranged in a working position on the machine.

A second spool **124** of elastomer yarn **122** is prearranged in a stand-by position and is suitable to be transferred to the aforesaid working position upon interruption of feed of the first elastomer yarn **121**, by any suitable means, such as the ones described in more detail with respect to the previous figures.

According to the present invention, the free end of the second elastomer yarn **122** is withheld, in a retaining area upstream of the interlacing device **105**, by a tubular retention member **106** suitable to be connected to appropriate suction means.

It must be observed that the second elastomer yarn **122** is unwound linearly from the second spool **124** to the inlet of the suction member **106**, disposed in said retaining area, in which the free end of the yarn **122** is withheld.

Arranged in proximity to the retaining area of the free end of the second elastomer yarn **122**, in practice immediately above the suction member **106**, is a coupling member **110** through which the covering yarn **120** and the first elastomer yarn **121** are conveyed continuously, to be fed together to the air jet interlacing device **105**.

Substantially, said coupling member **110** is an interlacing jet composed in substance by an operating head **111** bearing a fork **112** which defines a through channel **113**, with a vertical axis, for the yarns **120** and **121**; the channel **113** of the interlacing jet **110** is open at the front for insertion of said yarns **120**, **121**. The fork **112** is preferably made of a ceramic material.

In particular, the fork **112** shapes a flared inlet **114**, prearranged at the level of which is the portion of the second elastomer yarn **122** which is unwound linearly from the second spool **124** to the suction member **106** which retains its free end.

Associated with the operating head **111** is a conduit **115** to deliver a pressurized air jet, suitable to be connected to conventional means for compressed air feed. The conduit **115**

leads transversely into the channel **113**, by an appropriate hole produced transversely to the fork **112**.

The operating head **111** is suitable to be made to move in a horizontal direction by an alternate actuator member **116**, for example a pneumatic cylinder, connected to a support **117** fixed to the frame of the machine. This support **117** also has a deflecting roller **118**, freely rotating, suitable to prearrange the covering yarn **120** according to a vertical direction essentially aligned with the axis of the channel **113** of the fork **112**.

Moreover, a sensor member **107** is positioned above the interlacing jet **110**. The sensor member **107** is suitable to detect interruption of feed of the first elastomer yarn **121**, to control transfer of the second spool **124** of elastomer yarn to the working position and corresponding transfer of the first spool **123** of elastomer yarn to the stand-by position.

The method for automatic change of the elastomer yarn is easily understandable from the description above.

During normal operating conditions of the machine, the covering yarn **20** and the first elastomer yarn **121**, being unwound from the relative spool **123** disposed in the working position, are conveyed parallel through the interlacing jet **110**, **111** and then fed together to the second interlacing jet **105**. The second elastomer yarn **122**, the first portion of which has been unwound from the relative spool **124** is disposed in the stand-by position, and its free end is retained by the suction member **106**, positioned slightly below the interlacing jet **110**, **111**.

It must be noted that, in this condition, the portion of the second elastomer yarn **122** which extends from the second spool **124** to the suction member **106** is disposed at the level of the flared inlet **114** of the fork **112** of the interlacing jet **110**, **111**.

When the sensor member **107** detects interruption in the feed of the first elastomer yarn **121**, due to the spool **123** finishing or the yarn breaking, it controls, in appropriate time relationship, transfer of the second spool **124** of elastomer yarn to the working position and corresponding transfer of the first spool **123** of elastomer yarn to the stand-by position. It should be understood, however, that both in this embodiment as well as in the previous ones, that the stand-by and working positions of the two elastic yarn spools might be fixed, i.e. the position might not change when the yarn is put into the process.

Simultaneously, by means of the alternate actuator member **116**, movement of the interlacing jet **110**, **111** is performed in the direction transverse to the direction of feed of the yarns, so as to come into contact with the second elastomer yarn **122**.

In practice, the head **111** moves linearly between a withdrawn position, occupied in normal operating conditions to feed the yarns to the interlacing jet **105**, and a forward position, indicated with the dashed line **111***a*, in which the second yarn **122** is inserted in the channel **113** of the fork **112** of the head **111**. In this forward position, by means of the conduit **115**, a pressurized air jet is delivered to the interlacing jet **110**, **111** to join the second elastomer yarn **122** with the covering yarn **120**. Simultaneously, the free end of the second elastomer yarn **122** is released by the suction member **106**.

The interlacing jet **110**, **111** is then moved again to the withdrawn position of normal operation, to resume feed of the yarns **120**, **122** to the interlacing jet **105**.

The method and device described thus attain the object of performing, in a safe and efficient way, automatic threading of the elastomer yarn in machines for the production of interlaced yarns, in particular avoiding possible breakages of the elastomer yarn.

In fact, the elastomer yarn disposed in the stand-by position is unwound linearly for a short portion from the relative spool to the suction member which withholds the free end, in an area relatively far from the interlacing device **105**. At the moment of automatic change of the spool, this elastomer yarn is therefore not subject to handling, rubbing or other steps which could cause breakage thereof.

This arrangement also considerably facilitates periodic arrangement of the spool of elastomer yarn in the stand-by position, it being sufficient for the free end of this yarn to be taken to the level of the inlet of the suction member using conventional instruments.

A peculiarity of the method and of the device according to the present invention is constituted by the fact that when the spools are changed the new elastomer yarn is joined locally with a pressurized air jet to the covering yarn, which advances continuously, so that parallel feed of the two yarns to the interlacing device resumes immediately.

Obviously, it is possible for insertion of the elastomer yarn to be performed with the machine stopped, as well as with the machine running.

The means for replacing the cop of composite yarn are not shown in FIGS. **8**, **9** and **10**: they can be designed as in the previous embodiments.

It is understood that the drawing only shows practical embodiments of the invention, which may vary in forms and arrangements, without however departing from the scope on which the invention is based.

The invention claimed is:

1. A method for the production of a composite yarn and for automatic replacement of spools of elastic yarn, the method comprising the steps of:

feeding covering yarn along a feed path such that said covering yarn passes through at least a first interlacing jet;

delivering a first elastic yarn from a first spool such that said first elastic yarn passes through the first interlacing jet;

coating the first elastic yarn with said covering yarn to form composite yarn and winding the composite yarn on a cop;

arranging a second spool of a second elastic yarn in a stand-by position;

withholding an initial portion of said second elastic yarn in an area of said first interlacing jet;

replacing the cop of composite yarn with a new tube when delivery of said first elastic yarn is interrupted;

releasing said initial portion of the second elastic yarn after delivery of said first elastic yarn is interrupted;

automatically replacing said first spool of elastic yarn with said second spool of elastic yarn when delivery of said first elastic yarn is interrupted

joining said covering yarn and said second elastic yarn via the first interlacing jet to resume forming said composite yarn; and

winding the composite yarn on said new tube after said second elastic yarn has been covered with said covering yarn.

2. Method as claimed in claim **1**, wherein the initial portion of the second elastic yarn is withheld by a retaining member.

3. Method according to claim **2**, wherein:

said initial portion of the second elastic yarn is engaged by a deflecting element; and

said deflecting element is controlled to release said initial portion of the second elastic yarn.

4. Method as claimed in claim **3**, wherein said deflecting element withholds said second elastic yarn such that said

second elastic yarn does not enter the first interlacing jet, the second elastic yarn being disposed to be inserted automatically into said first interlacing jet when said deflecting element releases said second elastic yarn.

5. Method as claimed in claim **4**, wherein said second elastic yarn is inserted into the first interlacing jet via tension exerted by the retaining member.

6. Method as claimed in claim **1**, wherein the second elastic yarn is inserted into said first interlacing jet and withheld therein until said delivery of said first elastic yarn is interrupted.

7. Method as claimed in claim **1**, wherein said retaining member withholds said initial free end at least partly by suction.

8. Method as claimed in claim **1**, wherein feed of the second elastic yarn starts before joining to said covering yarn.

9. Method as claimed in claim **7**, wherein the second elastic yarn delivered before joining to the covering yarn is sucked by said retaining member.

10. Method as claimed in claim **1**, wherein the covering yarn and the elastic yarn pass through a nip, defined by a pair of rollers downstream of said first interlacing jet.

11. Method as claimed in claim **1**, wherein the composite yarn passes through a nip defined by a pair of rollers.

12. Method as claimed in claim **1**, wherein said elastic yarn is covered with said covering yarn via said first interlacing jet.

13. Method as claimed in claim **12**, wherein:

when delivery of said first elastic yarn is interrupted, said first interlacing jet is temporarily made to stop operating while the covering yarn continues to be fed therethrough;

after the second elastic yarn from the second spool starts to be delivered through the first interlacing jet, said first interlacing jet is re-activated to join the second elastic yarn to said covering yarn and resume production of said composite yarn.

14. Method as claimed in claim **13**, wherein said second elastic yarn is already standing by inside the first interlacing jet when feed of the first elastic yarn is interrupted.

15. Method as claimed in claim **1**, wherein said elastic yarn is covered with said covering yarn by a second interlacing jet, disposed downstream of the first interlacing jet along the path of the covering yarn.

16. Method as claimed in claim **15**, wherein said first interlacing jet is temporarily activated to join the covering yarn and the second elastic yarn and subsequently de-activated, while the second interlacing jet remains active at least to produce the composite yarn covering the elastic yarn with the covering yarn.

17. Method as claimed in claim **16**, wherein said second interlacing jet is temporarily deactivated between interruption of feed of the first elastic yarn and start of feed of the second elastic yarn.

18. Method as claimed in claim **15**, wherein when delivery of said first elastic yarn is interrupted, the covering yarn is fed through the first inoperative interlacing jet; after delivery of the second elastic yarn from the second spool starts, the first interlacing jet is temporarily activated to join the second elastic yarn to said covering yarn and subsequently deactivated.

19. Method as claimed in claim **12**, wherein:

said covering yarn is fed through a first nip between a pair of rollers, at least one of which is driven, and through said first interlacing jet;

the composite yarn delivered from said first interlacing jet is fed to a second nip between a second pair of rollers;

said second pair of rollers has a lower peripheral speed with respect to said first pair of rollers to relax the covering yarn between said second nip and said first nip; and

the elastic yarn is fed by a delivery roller through said first interlacing jet, the delivery roller having a lower delivery speed than the speed of said second pair of rollers, to subject said elastic yarn to a stretching effect between said second nip and said delivery roller.

20. Method as claimed in claim **1**, wherein said covering yarn is a textured yarn, preferably a multiple filament textured yarn.

21. Method as claimed in claim **20**, wherein said covering yarn is textured in line upstream of said first interlacing jet.

22. Method according to claim **1**, further comprising the steps of:

continuously feeding said covering yarn to a second interlacing jet;

simultaneously feeding to said second interlacing jet said first elastic yarn, said first elastomer yarn being unwound from said first spool, disposed in a working position, such that said covering yarn is interlaced with said first elastic elastomer yarn;

withholding a free end of said second elastic yarn, wound on said second spool, disposed in a stand-by position, in a retaining area;

detecting interruption of feed of said first elastic yarn, to control, in appropriate time relationship, transfer of said second spool of elastic yarn to said working position and transfer of said first spool of elastic yarn to said stand-by position;

performing a relative movement of said covering yarn with respect to said second elastic yarn, in proximity to said retaining area of said free end of the second elastic yarn, such that said covering yarn contacts said second elastic yarn; and

associating said second elastic yarn with said covering yarn using said first interlacing jet, simultaneously releasing said free end of the second elastic yarn, to resume feed of said yarns to said second interlacing jet.

23. Method as claimed in claim **22**, wherein said second elastic yarn is unwound linearly from said second spool to said retaining area, positioned upstream of said second interlacing jet.

24. Method as claimed in claim **22**, wherein said free end of the second elastic yarn is withheld in the retaining area by suctions means.

25. Method as claimed in claim **22**, wherein said covering yarn and said first elastic yarn are conveyed continuously through said first interlacing jet such that alternate motion is created via said first interlacing jet in a direction transverse to the direction of feed of said yarns, whereby said covering yarn contacts said second elastic yarn.

26. A device for the production of a composite yarn, the device comprising:

a first interlacing jet;

a covering yarn feed path extending toward said first interlacing jet;

an elastic yarn feed path extending toward said first interlacing jet, said covering yarn and said elastic yarn forming composite yarn;

supporting means for arranging at least a first spool of elastic yarn and at least a second spool of elastic yarn;

winding members winding the composite yarn on a cop being formed;

an interruption device, said interruption device interrupting feed of the composite yarn to said cop being formed,

said interruption device starting winding the composite yarn on a new winding tube;

a retaining member associated with said first interlacing jet to withhold an initial free end of the elastic yarn of said second spool;

a sensor detecting interruption of feed of said first elastic yarn to said first interlacing jet;

a control element controlling release of said initial free end of the elastic yarn of said second spool when said sensor detects an interruption in the feed of the first elastic yarn to said first interlacing jet.

27. Device as claimed in claim **26**, wherein said retaining member is a suction member.

28. Device according to claim **26**, further comprising a deflecting element arranged to withhold an initial portion of said second elastic yarn during delivery of the first elastic yarn to the first interlacing jet.

29. Device as claimed in claim **28**, wherein:

said retaining member and said deflecting element are disposed, with respect to said first interlacing jet, such that said retaining member and said deflecting element withhold the second elastic yarn in a position outside of said interlacing jet; and

the retaining member maintains said second elastic yarn in tension such that said second elastic yarn is inserted into said first interlacing jet when the deflecting element releases said second elastic yarn.

30. Device as claimed in claim **26**, wherein said first interlacing jet includes an air jet, said elastic yarn being covered with covering yarn via said air jet.

31. Device as claimed in claim **30**, further comprising:

a first pair of drawing rollers defining a first nip along the feed path of the covering yarn upstream of said first interlacing jet; and

a second pair of drawing rollers defining a second nip, downstream of said first interlacing jet, and wherein said second pair of rollers are controlled such that said second pair of rollers rotate at a lower peripheral speed than a peripheral speed of said first pair of rollers.

32. Device as claimed in claim **31**, further comprising a delivery roller to deliver the elastic yarn, wherein a delivery speed of said delivery roller is lower than the peripheral speed of the rollers of said second pair.

33. Device as claimed in claim **28**, wherein said retaining member and said deflecting element are disposed, with respect to said first interlacing jet, such that the second elastic yarn is located inside said first interlacing jet.

34. Device as claimed in claim **26**, wherein a second interlacing jet is located downstream of said first interlacing jet, said elastic yarn and said covering yarn being delivered to said second interlacing jet, said second interlacing jet covering the elastic yarn with the covering yarn.

35. Device as claimed in claim **34**, wherein said first interlacing jet is controlled such that said first interlacing jet is activated only temporarily to join the second elastic yarn to the covering yarn.

36. Device as claimed in claim **34**, wherein a third pair of drawing rollers are disposed downstream of said second interlacing jet, said third pair of drawing rollers defining a nip through which the composite yarn delivered from the second interlacing jet passes.

37. Device as claimed in claim **26**, further comprising a texturing station for said covering yarn.

38. Device as claimed in claim **26**, wherein said supporting means maintains said first spool in a working position and said second spool in a standby position, said support means automatically removing the first spool from said working position and transferring the second spool from the standby position to the working position when feed of said first elastic yarn is interrupted.

39. Device as claimed in claim **26**, wherein said supporting means of the first and of the second spool of elastic yarn are controlled such that a replacement cycle of the first spool of elastic yarn with the second spool of elastic yarn is started following interruption of feed of the first elastic yarn.

40. Device as claimed in claim **39**, wherein said sensor detects the end of the elastic yarn of said first spool.

41. Device as claimed in claim **26**, wherein said first interlacing jet is movable such that the second elastic yarn enters said first interlacing jet via movement of said first interlacing jet.

42. Device as claimed in claim **41**, wherein said first interlacing jet is movable from a withdrawn position to a forward position in a direction transverse to a direction of feed of said yarns, wherein said first interlacing jet is activated to join said second elastic yarn to said covering yarn.

43. Device as claimed in claim **26**, further comprising a collecting member, said collecting member collecting the covering yarn delivered between interruption of the first elastic yarn and start of delivery of the composite yarn formed with the second elastic yarn.

44. Device as claimed in claim **43**, wherein said collecting member comprises a suction member.

45. Device as claimed in claim **26**, wherein an oven is disposed along the path of said covering yarn upstream of said first interlacing jet.

46. A method for the production of a composite yarn and for automatic replacement of spools of elastic yarn, the method comprising the steps of:

feeding covering yarn along a feed path to a first interlacing jet;

delivering a first elastic yarn from a first spool to the first interlacing jet;

coating the first elastic yarn with said covering yarn to form composite yarn;

winding the composite yarn on a cop;

arranging a second spool of a second elastic yarn in a stand-by position;

holding an initial portion of said second elastic yarn in an area of said first interlacing jet;

replacing the cop of composite yarn with a new tube after delivery of said first elastic yarn is interrupted;

releasing said initial portion of the second elastic yarn after delivery of said first elastic yarn is interrupted, said first spool of elastic yarn being automatically replaced with said second spool of elastic yarn when delivery of said first elastic yarn is interrupted, wherein the feed of covering yarn to said first interlacing jet decreases or stops when said first spool of elastic yarn is automatically replaced with said second spool of elastic yarn;

joining said covering yarn and said second elastic yarn via the first interlacing jet to resume forming said composite yarn; and

winding the composite yarn on said new tube after said second elastic yarn has been covered with said covering yarn.

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